IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Akinobu SHIMADA et al.

Serial No.   10/771,455

Filed: February 5, 2004

For: DISK ARRAY APPARATUS AND CONTROL METHOD FOR DISK
                ARRAY APPARATUS

PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(MPEP §708.02)

June 28, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby petition the Commissioner to make the above-identified

application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP

§708.02(VIII), Applicants state the following.

(A)   This Petition is accompanied by the fee set forth in 37 CFR §1.17(h).

The Commissioner is hereby authorized to charge any additional payment

due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention.

If the Office determines that all claims are not directed to a single

invention, Applicant will make an election without traverse as a prerequisite to the

grant of special status in conformity with established telephone restriction practice.

(C) A pre-examination search has been conducted.

The search was directed to the invention set forth in claims 1-20. The invention is directed to a disk array apparatus comprising a host adapter for transferring data between a host system and the disk array apparatus; a cache memory for storing data written from the host adapter; a storage device adapter for executing control to write data to the cache memory or to read data from the cache memory; a control memory to which control information is to be written by the host adapter and the storage device adapter; a plurality of kinds of storage devices to which data are to be written on the basis of control by the storage device adapter; a data movement control part provided in the storage device adapter, the host adapter creating a plurality of logical devices on the basis of storage areas of the plurality of kinds of storage devices and executing control to cause the plurality of logical devices to be objects to be accessed from the host system, the data movement control part executing control, when the host adapter receives an access control command to specify an access operation to a first logical device included in the plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in the plurality of kinds of storage devices, according to the content of the specified access operation.

The search of the above features was conducted in the following areas: class 707, subclasses 102 and 200-204, class 709, subclass 203 and 226, class 711, subclass 111-114, 136, 154 and 160-162 and class 714, subclasses 5-7.

Additionally, a computer database search was conducted on the USPTO system EAST.

(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:

U.S. Patent Number	Inventors
5,392,244	JACOBSON et al.
5,537,588	ENGELMANN et al.
5,584,018	KAMIYAMA
5,893,139	KAMIYAMA
6,446,161	YAMAMOTO et al.
6,691,136	LEE et al.
6,792,503	YAGI et al.
6,826,665	NAMBU

U.S. Patent Publication No.	Inventor(s)
2002/0166026	ULRICH et al.
2004/0073677	HONMA et al.

A copy of each of these references (as well as other references uncovered during the search) is enclosed in an accompanying IDS.

(E) It is submitted that the present invention is patentable over the references for the following reasons.

It is submitted that the cited references, whether taken individually or in combination with each other, fail to teach or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to teach or suggest in combination with the other limitations recited in the claims:

a first feature of the present invention as recited in independent claim 1 wherein a data movement control part executing control, when the host adapter receives an access control command to specify an access operation to a first logical device included in the plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in the plurality of kinds of storage devices, according to the content of the specified access operation; and

a second feature of the present invention as recited in independent claim 16 recites wherein the access operation to data associated with the first logical device is limited by the access control command, moving the data from the first storage device to the second storage device, and restoring the data moved to the second storage device to the first storage device when limitation of the access operation is released by the access control command.

To the extent applicable to the present Petition, Applicants submit that although the distinguishing feature(s) may represent a substantial portion of the claimed invention, the claimed invention including said feature(s) and their inter-

operation provides a novel storage system and system and method related to or implemented in or by said storage system not taught or suggested by any of the references of record.

The references considered most closely related to the claimed invention are briefly discussed below:

U.S. Patent No. 5,392,244 (Jacobson et al.) discloses a disk array having a plurality of disks, a controller for transferring data to and from the disks, and a RAID management system for mapping RAID areas on the disks. Initially, the management system stores data in one of the areas according to mirror redundancy, and stores data in the other RAID area according to a parity redundancy. The management system then transfers data from a first memory location to a second memory location based on a defined performance protocol for a particular data, such as a migration policy which employs data access recentness or data access frequency. (See, e.g., Abstract and column 2, lines 8-30.) However, unlike the present invention, Jacobson et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Jacobson et al. does not disclose or suggest the above described first feature of

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the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,537,588 (Engelmann et al.) discloses a method and apparatus for a data processing system that comprises a data processor, a disk storage subsystem, and a disk manager. The system partitions the disk storage system into multiple storage areas including a first area and a second area, and stores data into a first storage area when the access activity value is calculated to be greater than a predetermined threshold, and stores the data into an inactive second storage area when the access activity value is calculated to be less than the first predetermined threshold value. (See, e.g., Abstract and column 2, line 49, through column 3, line 4.) However, unlike the present invention, Engelmann et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Engelmann et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,584,018 (Kamiyama) discloses a storage system that reads and writes data to and from a plurality of detachable information storage devices such as optical disks. The system calculates and stores the access frequencies of data stored in the plurality of media loaded in the apparatus, and relocates the data that is rarely accessed into a specific storage location. The system performs an automatic relocation of data under control of the system in order to prevent immediate large scale data relocation in the event the disk becomes full. (See, e.g., Abstract and column 1, line 39, through column 2, line 2.) However, unlike the present invention, Kamiyama does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Kamiyama does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,893,139 (Kamiyama) discloses a data storage system which is comprised of a plurality of data storage devices constructed in a hierarchical structure of a plurality of levels having different access times and

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having different access information items. The data is stored in a particular data storage device according to the access frequency of the data. Data with high access frequency will be stored in the memory of a digital PPC, while data which is not used very often will be stored on a hard disk incorporated in the file server. (See, e.g., Abstract, column 15, lines 33-48, and column 15, line 60, through column 16, line 3.) However, unlike the present invention, Kamiyama does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Kamiyama does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 6,446,161 (Yamamoto et al.) discloses a storage controller that reallocates logical disk devices having a high access frequency to physical disk devices having a higher speed. The storage controller calculates an access frequency of each logical disk, and selects a first logical disk device of which the access frequency exceeds a predetermined value, the first logical disk device being allocated to a first physical disk device, and selects a second logical

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disk device which has an access frequency equal to or less than a second predetermined value. (See, e.g., Abstract and column 2, line 30, through column 3, line 3.) However, unlike the present invention, Yamamoto et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Yamamoto et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 6,691,136 (Lee et al.) discloses a database system in which most-recently accessed records are stored in a buffer in random access memory, while the least-recently accessed records are stored on static media that are consolidated so that they are continuously stored. Non-accessed records are contiguously consolidated. There are times when the most-recently accessed records from the buffer are flushed to static media, ensuring their contiguous storage. (See, e.g., Abstract and column 2, lines 12-38.) However, unlike the present invention, Lee et al. does not disclose a data movement control part executing control when a host adapter receives an access control

command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Lee et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 6,792,503 (Yagi et al.) discloses a disk storage accessing system in which a plurality of computers share and access a plurality of disk storage devices. The system calculates a frequency of access to each storage device, and moves data from a first storage disk to a second storage disk when the frequency of access exceeds a predetermined threshold, and instructs the computer that accesses the first storage disk to change its access path so that it accesses the second storage disk instead. (See, e.g., Abstract and column 1, line 55, through column 2, line 19.) However, unlike the present invention, Yagi et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified

access operation. More particularly, Yagi et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 6,826,665 (Nambu) discloses a data backup system that takes data from various different systems, and stores it on different storage devices depending on the importance of the data and the reliability of the backup storage devices. Data that is flagged as very important is stored on a backup device having a high reliability level and data that is flagged as less important is stored on a backup device having a lower reliability level. (See, e.g., Abstract and column 1, line 48, through column 2, line 3.) However, unlike the present invention, Nambu teaches a server system that interacts with a plurality of different operating system platforms, and Nambu does not teach a disk array apparatus. Thus, Nambu does not disclose a disk array apparatus that includes a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Nambu does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described

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second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent Publication No. 2002/0166026 (Ulrich et al.) discloses a computer storage system for data blocking mapping that includes a plurality of disk drives for storing parity groups. Frequently-accessed content can automatically be moved to server nodes that have high bandwidth capacities capable of serving high numbers of client requests, and less-frequently-accessed material can be moved to server nodes that have higher storage capacities or greater available storage space where the data can be stored without significant bandwidth limitations. (See, e.g., Abstract and paragraph 504.) However, unlike the present invention, Ulrich et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Ulrich et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

U.S. Patent Publication No. 2004/0073677 (Honma et al.) discloses an integrated storage system in a computer system that is constructed by a

collaboration of components or functions of a storage system in which a SAN is used. The computer system includes a multiple variety of client computers, multiple variety of servers, multiple variety of storage devices, a local area network to connect the computers and servers, and a storage area network which is connected between the servers and the storages. The storage units, having a small capacity but high speed volumes, hold data that has a high access frequency. The storage units that have a large capacity but low performance volumes hold data that has a low access frequency. (See, e.g., Abstract, paragraph 78, and FIG. 15.) However, unlike the present invention, Honma et al. does not disclose a data movement control part executing control when a host adapter receives an access control command to specify an access operation to a first logical device included in a plurality of logical devices, to move data associated with the first logical device among a plurality of storage devices that are different in reliability from one another and are included in a plurality of kinds of storage devices, according to the content of the specified access operation. More particularly, Honma et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 16, in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in

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independent claim 16, in combination with the other limitations recited in each of the independent claims, it is submitted that all of the claims are patentable over the cited references whether said references are taken individually or in combination with each other.
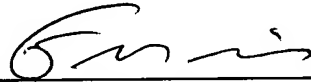
CONCLUSION

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The United States Patent and Trademark Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the United States Patent and Trademark Office may locate in its own independent search. Further, while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the United States Patent and Trademark Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.

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PETITION FEE
Under 37 CFR 1.17(f), (g) & (h)
TRANSMITTAL
(Fees are subject to annual revision)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number	10/771,455
Filing Date	February 5, 2004
First Named Inventor	Akinobu SHIMADA et al.
Art Unit	2188
Examiner Name	M. Padmanabhan
Attorney Docket Number	501.43495X00

(Stamp: NOTICE JUN 2 8 2005 PATENT & TRADEMARK OFFICE)

Enclosed is a petition filed under 37 CFR 1.102(d) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of $ 130.00 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition (fees)

☒ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. <u>50-1417</u>:

    ☐ petition fee under 37 CFR 1.17(f), (g) or (h)   ☒ any deficiency of fees and credit of any overpayments
Enclose a duplicative copy of this form for fee processing.

☐ Check in the amount of $ _____ is enclosed.

☒ Payment by credit card (From PTO-2038 or equivalent enclosed). Do not provide credit card information on this form.

Petition Fees under 37 CFR 1.17(f):   **Fee $400**   **Fee Code 1462**
For petitions filed under:
§ 1.53(e) - to accord a filing date.
§ 1.57(a) - to according a filing date.
§ 1.182 – for decision on a question not specifically provided for.
§ 1.183 – to suspend the rules.
§ 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
§ 1.741(b) – to accord a filing date to an application under §1.740 for extension of a patent term.

Petition Fees under 37 CFR 1.17(g):   **Fee $200**   **Fee code 1463**
For petitions filed under:
§1.12 - for access to an assignment record.
§1.14 - for access to an application.
§1.47 - for filing by other than all the inventors or a person not the inventor.
§1.59 - for expungement of information.
§1.103(a) - to suspend action in an application.
§1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
§1.295 - for review of refusal to publish a statutory invention registration.
§1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
§1.377 – for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
§1.550(c) – for patent owner requests for extension of time in <u>ex parte</u> reexamination proceedings.
§1.956 – for patent owner requests for extension of time in <u>inter partes</u> reexamination proceedings.
§ 5.12 – for expedited handling of a foreign filing license.
§ 5.15 – for changing the scope of a license.
§ 5.25 – for retroactive license.

Petition Fees under 37 CFR 1.17(h):   **Fee $130**   **Fee Code 1464**
For petitions filed under:
§1.19(g) – to request documents in a form other than that provided in this part.
§1.84 – for accepting color drawings or photographs.
§1.91 – for entry of a model or exhibit.
§1.102(d) – to make an application special.
§1.138(c) – to expressly abandon an application to avoid publication.
§1.313 – to withdraw an application from issue.
§1.314 – to defer issuance of a patent.

Name (Print/Type)	Frederick D. Bailey	Registration No. (Attorney/Agent)	42,282
Signature	*(signature)*	Date	June 28, 2005